

# 74ALVC245

## Low Voltage Bidirectional Transceiver with 3.6V Tolerant Inputs and Outputs

### Features

- 1.65V to 3.6V  $V_{CC}$  supply operation
- 3.6V tolerant inputs and outputs
- Power-off high impedance inputs and outputs
- Supports Live Insertion and Withdrawal<sup>(1)</sup>
- $t_{PD}$ :
  - 3.4ns max. for 3.0V to 3.6V  $V_{CC}$
  - 3.9ns max. for 2.3V to 2.7V  $V_{CC}$
  - 6ns max. for 1.65V to 1.95V  $V_{CC}$
- Uses patented Quiet Series™ noise/EMI reduction circuitry
- Latchup conforms to JEDEC JED78
- ESD performance:
  - Human body model > 2000V
  - Machine model > 200V

### Note:

1. To ensure the high impedance state during power up and power down,  $\overline{OE}_n$  should be tied to  $V_{CC}$  through a pull up resistor. The minimum value of the resistor is determined by the current sourcing capability of the driver.

### General Description

The ALVC245 contains eight non-inverting bidirectional buffers with 3-STATE outputs and is intended for bus oriented applications. The  $\overline{T/R}$  input determines the direction of data flow. The  $\overline{OE}$  input disables both the A and B ports by placing them in a high impedance state.

The 74ALVC245 is designed for low voltage (1.65V to 3.6V)  $V_{CC}$  applications with I/O compatibility up to 3.6V.

The 74ALVC245 is fabricated with an advanced CMOS technology to achieve high-speed operation while maintaining low CMOS power dissipation.

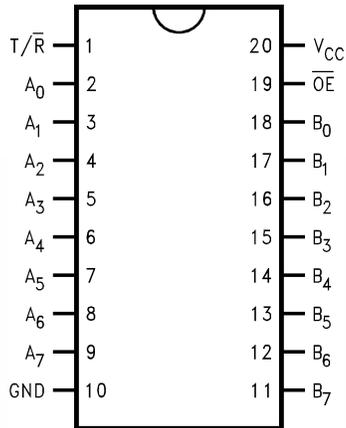
### Ordering Information

Order Number	Package Number	Package Description
74ALVC245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74ALVC245MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

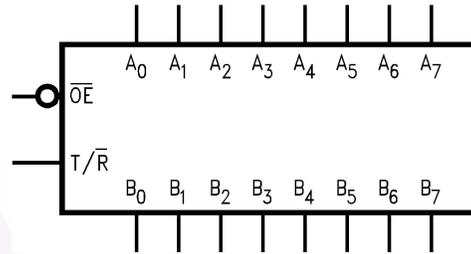
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

### Connection Diagram



### Logic Symbol



### Truth Table

Inputs		Outputs
OE	T/R	
L	L	Bus B <sub>0</sub> -B <sub>7</sub> Data to Bus A <sub>0</sub> -A <sub>7</sub>
L	H	Bus A <sub>0</sub> -A <sub>7</sub> Data to Bus B <sub>0</sub> -B <sub>7</sub>
H	X	HIGH Z State on A <sub>0</sub> -A <sub>7</sub> , B <sub>0</sub> -B <sub>7</sub> <sup>(2)</sup>

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

Z = High Impedance

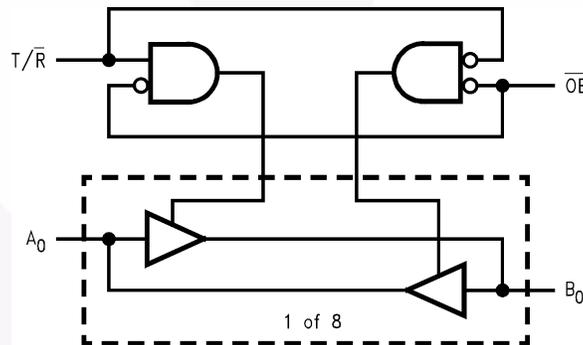
**Note:**

- Unused bus terminals during HIGH Z State must be held HIGH or LOW.

### Pin Description

Pin Names	Description
OE	Output Enable Input (Active LOW)
T/R	Transmit/Receive Input
A <sub>0</sub> -A <sub>7</sub>	Side A Inputs or 3-STATE Outputs
B <sub>0</sub> -B <sub>7</sub>	Side B Inputs or 3-STATE Outputs

### Logic Diagram



## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
$V_{CC}$	Supply Voltage	-0.5V to +4.6V
$V_I$	DC Input Voltage	-0.5V to 4.6V
$V_O$	Output Voltage <sup>(3)</sup>	-0.5V to $V_{CC}$ +0.5V
$I_{IK}$	DC Input Diode Current, $V_I < 0V$	-50mA
$I_{OK}$	DC Output Diode Current, $V_O < 0V$	-50mA
$I_{OH}/I_{OL}$	DC Output Source/Sink Current	±50mA
$I_{CC}$ or GND	DC $V_{CC}$ or GND Current per Supply Pin	±100mA
$T_{STG}$	Storage Temperature Range	-65°C to +150°C

**Note:**

3.  $I_O$  Absolute Maximum Rating must be observed, limited to 4.6V.

## Recommended Operating Conditions<sup>(4)</sup>

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating
$V_{CC}$	Supply Voltage	1.65V to 3.6V
$V_I$	Input Voltage	0V to $V_{CC}$
$V_O$	Output Voltage	0V to $V_{CC}$
$T_A$	Free Air Operating Temperature	-40°C to +85°C
$\Delta V / \Delta t$	Minimum Input Edge Rate: $V_{IN} = 0.8V$ to $2.0V$ , $V_{CC} = 3.0V$	10ns/V

**Note:**

4. Floating or unused control inputs must be held HIGH or LOW.

## DC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	Min.	Max.	Units
V <sub>IH</sub>	HIGH Level Input Voltage	1.65–1.95		0.65 x V <sub>CC</sub>		V
		2.3–2.7		1.7		
		2.7–3.6		2.0		
V <sub>IL</sub>	LOW Level Input Voltage	1.65–1.95			0.35 x V <sub>CC</sub>	V
		2.3–2.7			0.7	
		2.7–3.6			0.8	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65–3.6	I <sub>OH</sub> = –100μA	V <sub>CC</sub> – 0.2		V
		1.65	I <sub>OH</sub> = –4mA	1.2		
		2.3	I <sub>OH</sub> = –6mA	2.0		
		2.3	I <sub>OH</sub> = –12mA	1.7		
		2.7		2.2		
		3.0		2.4		
		3.0	I <sub>OH</sub> = –24mA	2		
V <sub>OL</sub>	LOW Level Output Voltage	1.65–3.6	I <sub>OL</sub> = 100μA		0.2	V
		1.65	I <sub>OL</sub> = 4mA		0.45	
		2.3	I <sub>OL</sub> = mA		0.4	
		2.3	I <sub>OL</sub> = 12mA		0.7	
		2.7			0.4	
		3.0	I <sub>OL</sub> = 24mA		0.55	
I <sub>I</sub>	Input Leakage Current	3.6	0 ≤ V <sub>I</sub> ≤ 3.6V		±5.0	μA
I <sub>OZ</sub>	3-STATE Output Leakage	3.6	0 ≤ V <sub>O</sub> ≤ 3.6V		±10	μA
I <sub>CC</sub>	Quiescent Supply Current	3.6	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0		10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	3–3.6	V <sub>IH</sub> = V <sub>CC</sub> – 0.6V		750	μA

## AC Electrical Characteristics

Symbol	Parameter	T <sub>A</sub> = –40°C to +85°C, R <sub>L</sub> = 500Ω								Units
		C <sub>L</sub> = 50pF				C <sub>L</sub> = 30pF				
		V <sub>CC</sub> = 3.3V ± 0.3V		V <sub>CC</sub> = 2.7V		V <sub>CC</sub> = 2.5V ± 0.2V		V <sub>CC</sub> = 1.8V ± 0.15V		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay	1.3	3.4		3.9	1.0	3.5	1.5	6.0	ns
t <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable Time	1.6	5.5		6.3	2.0	6.0	2.7	8.6	ns
t <sub>PLZ</sub> , t <sub>PHZ</sub>	Output Disable Time	1.7	5.5		5.3	0.8	4.8	1.5	8.0	ns

## Capacitance

Symbol	Parameter	Conditions	$T_A = +25^\circ\text{C}$		Units	
			$V_{CC}$	Typical		
$C_{IN}$	Input Capacitance	Control	$V_I = 0\text{V}$ or $V_{CC}$	3.3	3	pF
$C_{I/O}$	Input/ Output Capacitance	A or B Ports	$V_I = 0\text{V}$ or $V_{CC}$	3.3	6	
$C_{PD}$	Power Dissipation Capacitance	Outputs Enabled	$f = 10\text{MHz}$ , $C_L = 0\text{pF}$	3.3	30	pF
				2.5	27	
				1.8	25	
		Outputs Disabled	$f = 10\text{MHz}$ , $C_L = 0\text{pF}$	3.3	0	
				2.5	0	
			1.8	0		

## AC Loading and Waveforms

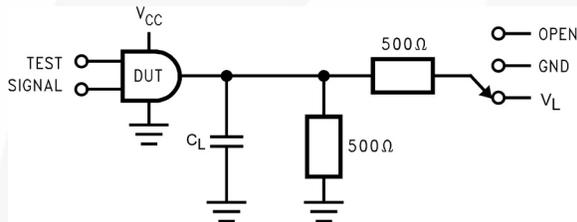


Figure 1. AC Test Circuit

Table 1. Values for Figure 1

Test	Switch
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$V_L$
$t_{PZH}$ , $t_{PHZ}$	GND

Table 2. Variable Matrix

(Input Characteristics:  $f = 1\text{MHz}$ ;  $t_r = t_f = 2\text{ns}$ ;  $Z_0 = 50\Omega$ )

Symbol	$V_{CC}$			
	$3.3\text{V} \pm 0.3\text{V}$	$2.7\text{V}$	$2.5\text{V} \pm 0.2\text{V}$	$1.8\text{V} \pm 0.15\text{V}$
$V_{mi}$	1.5V	1.5V	$V_{CC} / 2$	$V_{CC} / 2$
$V_{mo}$	1.5V	1.5V	$V_{CC} / 2$	$V_{CC} / 2$
$V_X$	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.3\text{V}$	$V_{OL} + 0.15\text{V}$	$V_{OL} + 0.15\text{V}$
$V_Y$	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.3\text{V}$	$V_{OH} - 0.15\text{V}$	$V_{OH} - 0.15\text{V}$
$V_L$	6V	6V	$V_{CC} \times 2$	$V_{CC} \times 2$

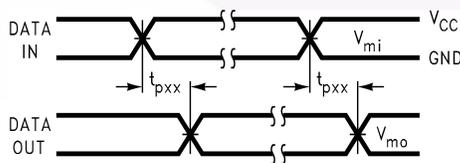


Figure 2. Waveform for Inverting and Non-Inverting Functions

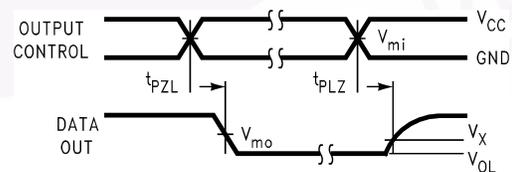
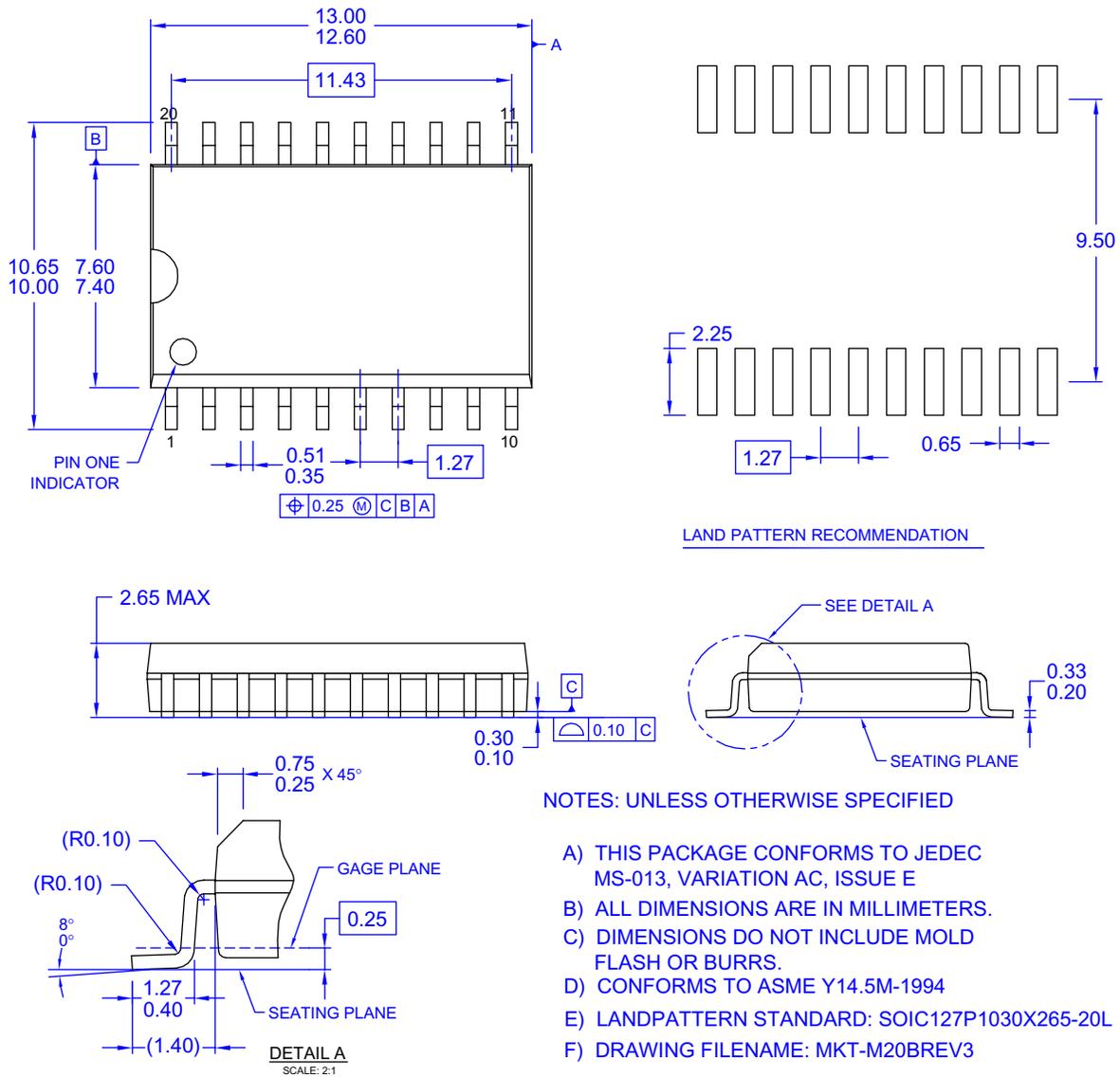


Figure 3. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic

## Physical Dimensions



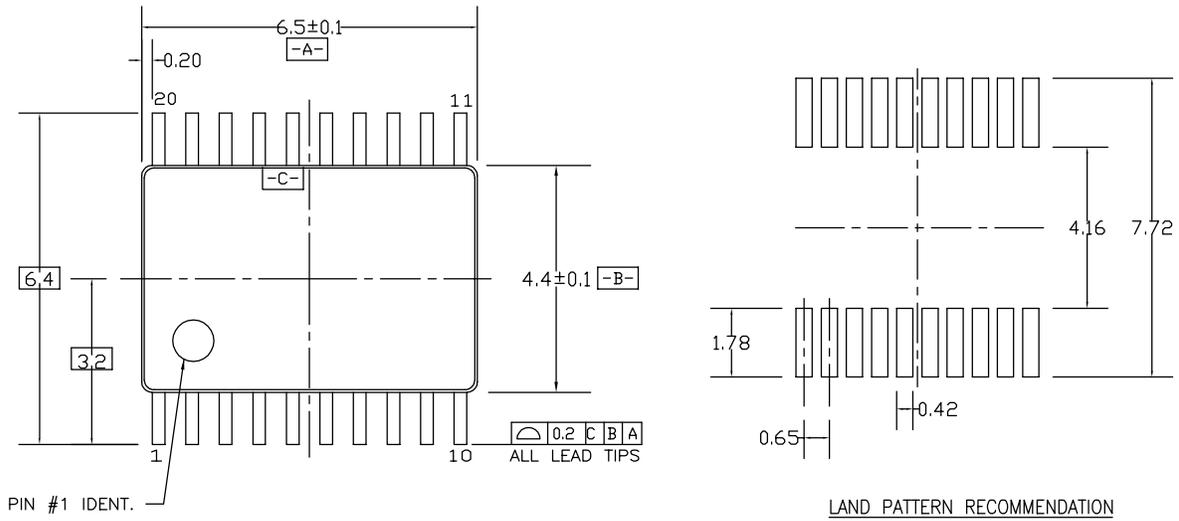
**Figure 4. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide**

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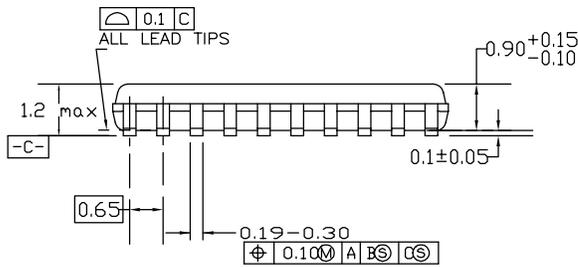
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**Physical Dimensions (Continued)**

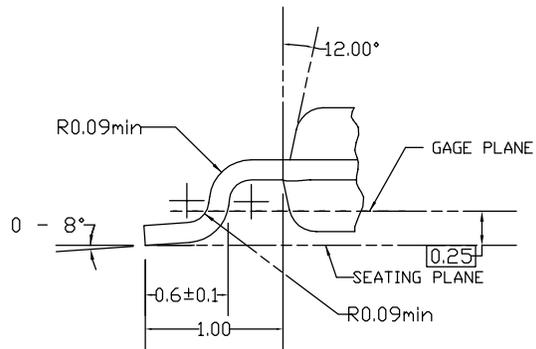
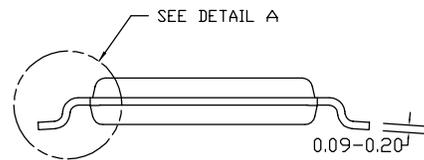


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MD-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REV D1

**Figure 5. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide**

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Rev. I32